EROS Data Center

Monthly Activity Reports

January 1, 1980 - December 31,1980

EROS Data Center Monthly Activity Report January 1980

USGS/EROS Field Office in Anchorage: The EROS Program will open a Field Office in Anchorage, Alaska, to expand its programs for transferring remote-sensing technology to the Department of the Interior and cooperating government agencies with resource management responsibilities in Alaska. Departmental approval obtained in January enables the Data Center to proceed with plans to open the Field Office by late March 1980. The Field Office will be located on the third floor of the Skyline Building, presently occupied by USGS, at 218 E Street, Anchorage. An interactive digital image analysis system has been purchased and will be installed in the Field Office during the second week of March. Acceptance testing of the system is scheduled for the third week of March. Provided the system meets all tests, it will be used for image analysis demonstration and training purposes shortly afterward. Once the system has been debugged and data analysts are fully familiar with its capabilities, the system will be available for Department of Interior and other government personnel who wish to use the system in conducting resource inventories in Alaska.

David M. Carneggie, of the Applications staff at the EROS Data Center will be the Chief of the Alaska Field Office and is expected to move to Anchorage in late February. Equipment for manual image analysis also will be available to support training, demonstrations, and project work. It is anticipated that the Alaska Field Office will be staffed initially with four remote sensing scientists (including two data analysts) but may not be fully operational until renovations to the third floor of the Skyline Building have been completed.

U.S. Fish and Wildlife Service Course, NSTL Station, Mississippi: The tenth in a series of remote sensing applications training courses for U.S. Fish and Wildlife Service (FWS) was presented at NSTL Station, Mississippi. The four and one-half day course was jointly taught by EDC personnel and the EROS Applications Assistance Facility at NSTL Station. The course emphasized the interpretation of color infrared aerial photographs and Landsat images for wildlife habitat mapping. The FWS National Wetland Inventory classification framework was used as the basis for the interpretation exercises, and was well received by course attendees. A one-day field trip to forested wetland and marsh areas allowed attendees to verify interpretations.

Corps of Engineers and U.S. Fish and Wildlife Service Project: EDC personnel travelled to Ft. Belvoir, Virginia, to participate in a meeting with personnel from the Corps of Engineers (COE) and U.S. Fish and Wildlife Service (FWS) to discuss Alaskan wetland mapping programs and the feasibility of a cooperative demonstration project. The Corps of Engineers reported promising results from the use of Landsat data for distinguishing wetlands from non-wetlands. They feel Landsat may be a viable tool for wetland mapping in areas not currently scheduled by the FWS for a National Wetland Inventory project. The FWS had a cooperative

project with the Jet Propulsion Lab to process Landsat data covering the area on the Anchorage 1:250,000-scaled USGS map. Their tentative assessment is that Landsat currently cannot provide the level of detail and accuracy required for National Wetland Inventory standards. FWS is still interested in pursuing research efforts to evaluate the feasibility of monitoring change in wetlands, techniques for map updating and revision, and Landsat applications related to wildlife habitat assessment. A tentative decision was made to define a cooperative demonstration project, with COE, FWS, and EROS, to evaluate Landsat data for mapping and describing vegetation communities in wetland environments. The project will likely begin in the spring of 1980 and be completed in 1981.

Dismal Swamp Project: An EDC staff member met with a Water Resources Division representative at the Dismal Swamp (Virginia, North Carolina border) to discuss the accuracy assessment of the Landsat classification of the Swamp. The results indicated that many forested wetland vegetation types cannot be mapped with a high degree of accuracy. A report on this project is being prepared and should be available by early spring, 1980.

Visit by Delegation from People's Republic of China: During the period December 3, 1979, through January 11, 1980, the EROS Data Center hosted a visit to this facility by a four-member delegation from the Scientific Research Institute for Petroleum Exploration and Development of the People's Republic of China's Ministry of Petroleum. Those scientists participating in this multi-purpose trip were Wang Wen-yen, Chief Geologist; Lu Chih-liang, Senior Engineer; Sun Tian-me, Computer Engineer; and Chen Qian-yuan, Computer Programming Engineer and Geophysicist.

Members of the delegation spent considerable time interacting with EDC personnel. These activities included discussions on the applications of remote sensing to various renewable and non-renewable resource problems, briefings and discussions on subjects relating to data processing and computer hardware, and demonstrations of and hands-on experience with the data analysis systems in the Data Analysis Laboratory. In addition, considerable time was spent reviewing and discussing Tsaidam Basin project work and activities with the EDC scientists who visited China last summer. The subject of future cooperative efforts was discussed in detail and ideas were exchanged for incorporation into formal project proposals. This visit by and exchange of ideas with this delegation of Chinese scientists is viewed as having been very successful and very productive.

BLM Digital Image Analysis Course: A four and one-half day course entitled "Introduction to Digital Image Analysis of Remotely Sensed Data" was presented January 21-25, 1980, for 24 participants from the Bureau of Land Management (BLM) and EROS Data Center. Course material was expanded from previous EDC offerings of digital image analysis courses to include lengthy sessions on survey sampling applications and the use of Landsat data in conjunction with other geographically related data, including terrain data. The Arizona Vegetation Resource Inventory (AVRI) data set, derived from a cooperative demonstration project with the BLM, served as a source of example material in much of the course.

Specific applications of Landsat data for mapping and inventorying rangeland resources were presented. Lectures were supplemented with ten workshop exercises and a number of classroom and laboratory demonstrations of interactive digital image analysis techniques. Participant response to the course was very favorable and many expressed a desire for follow-on hands-on training.

BLM/ASP Workshop: An EDC scientist presented a paper at the BLM/ASP Workshop on "Practical Applications and Use of Aerial Photography," Denver, Colorado. The paper was entitled, "State-of-the-Art Multi-Level Sampling Utilizing Remotely Sensed Data." The workshop was attended by approximately 75 scientists and technicians.

1979 EDC Training Program: During 1979, EDC staff presented or participated in 23 remote sensing training courses. A total of 528 students, including 162 foreign scientists, participated in the courses, which totalled 153 days of training and 3,297 student-days.

Two courses were presented for personnel of the BLM and two for the U.S. Fish and Wildlife Service. Two courses pertained to surface mining and were offered in cooperation with the Office of Surface Mining, and a basic geology course was presented to personnel of the USGS Conservation Division. The staff gave two open-enrollment geology courses and two open-enrollment water resources courses. Two 4-week international courses were presented at EDC, and staff members participated in courses in Hawaii (for Pacific-region scientists), Mexico City, Buenos Aires, and Nairobi.

16mm Training Films: EDC staff have been asked to assist the American Society of Photogrammetry (ASP) in the development of two training films. These films, which will be produced by professional film makers, will demonstrate applications of remotely sensed data to specific discipline related problems. They will be used to train scientists in operational approaches to problem solving within specific disciplines. EDC personnel will serve as coordinators for the film project and provide technical and training assistance as the project is developed.

1979 DAL Utilization Summary: Summary statistics for DAL utilization in 1979 show that the Image 100, the IDIMS system and the ISI-270 System were used for 2,850 hours, 4,530 hours and 653 hours, respectively. Based on a 40-hour prime shift work week, this represents an average of 17½ hours a day on the IDIMS, and 11 hours a day on the Image 100 System. More than 50 percent of the machine time logged on the Image 100 and 75 percent of the machine time logged on IDIMS, was in support of training and demonstrations, while 25 percent of the machine time was devoted to software development on the IDIMS. Among the user groups making use of the DAL (other than EROS Program participants) were the Remote Sensing Institute/ S.D.S.U. group, Bureau of Land Management, University of Minnesota, Water Resources Division, University of Iceland, Fish and Wildlife Service, U.S. Forest Service, University of Alaska, Washington State Department of Natural Resources, University of California-Riverside, University of Denver, National Park Service, University of Idaho, Harvard

University, Minnesota State Planning Agency and the Army Corps of Engineers. Project work supported by the DAL included streamflow estimates in Tennessee coal mine areas, land use planning in Minnesota, desertification detection in Utah, geologic interpretation of selected Chinese areas, Idaho Vegetation Resource inventory, coal surface mining activities in Montana, developing a fuel fire behavior model, and mapping inundation levels and water volume in Florida Everglades.

Data Production and Sales: Fiscal year 1980 shipped reimbursable sales through January 1980 amounted to \$1,170,000, with January's total at \$323,000. Work-In-Process is currently at \$314,000, with \$244,000 representing retrospective orders to NASA/GSFC.

EROS Digital Image Processing System (EDIPS): Approximately 2600 scenes of MSS data were added to the image file in January. End-of-month backlogs total less than 100 scenes. The schedule for production RBV data has now slipped to March 1, 1980. The preliminary design review for the TRW upgrade to EDIPS was held this month, with no major design or schedule problems encountered. TRW has received technical direction to implement the option for on-line screening of pipeline image data. The critical design review is currently scheduled for mid-March.

Historical Landsat Data: Agreement has been reached with NASA to define a scenario for conversion of historical WBVT archives to X-format CCT's. EDC is developing automated ordering and reporting systems to track approximately 25,000 scenes selected for conversion.

Alaskan Activity: Seventy-six visitors made use of the facility this month, in addition to many Geophysical Institute personnel. Data ordered from EDC came to \$2200. Among a diverse number of projects employing remotely-sensed data ordered from EDC is an attempt to use aerial photographs to try and find the very old, original pack trail to Circle City from Fairbanks.

NSTL: There were approximately 125 visitors to the facility during this reporting period. A member of the staff traveled to Louisiana State University in Baton Rouge and addressed 20 members of the U.S. Army Corps of Engineers who were attending a remote sensing workshop. Two Remote Sensing Workshops were conducted at the facility this month. The first was held January 14-18 in conjunction with the Data Center and the U.S. Fish and Wildlife Service. There were 21 participants. The following week, January 22-25, a Forestry Remote Sensing Workshop was held in conjunction with the U.S. Forest Service. Twelve people participated. A new zoom transfer scope was delivered and set up in the Photo Optical Lab. Two workshops are scheduled for February.

EROS Data Center Monthly Activity Report February 1980

<u>Data Production and Sales</u>: Shipped reimbursable sales as well as incoming sales amounted to \$1,463,000 for the first five months of FY '80; both are 1.7 percent ahead of the fiscal year plan for this period. February's shipped sales amounted to \$293,000. The current Work-In-Process (WIP) is \$158,000. In addition, there are \$221,000 worth of retrospective CCT's on order to NASA/Goddard.

EROS Digital Image Processing System (EDIPS): Approximately 1800 scenes of MSS data were added to the main image file during February, which brings the total number of scenes processed through EDIPS to about 26,000. GSFC still has a backlog of approximately 9,000 scenes of MSS data of which many are problem type scenes acquired during initial operation of the new digital system. Also, approximately 9,000 scenes of RBV data have been acquired since February 1, 1979, however, these scenes are being converted to 70 mm film via the EBR system since the GSFC digital system is not production processing RBV data as yet. The EDIPS upgrade is progressing on schedule with the Critical Design Review to occur March 20 and 21 and shipment to EDC scheduled for early August.

Production Management System Improvements: New software has been implemented to provide improved scheduling and tracking of work orders in the Photo Lab. Via a terminal located in the staging process, Photo Lab personnel are able to examine the workload by product line and determine the number and type of work orders scheduled to be processed during the next work period. Also, another terminal located in the product inspection process provides feedback concerning rejected products requiring rework, thus allowing more accurate and timely tracking of problem work orders.

Pecora VI Symposium Planning: Many of the detailed plans for the Sixth Annual William T. Pecora Symposium, scheduled for April 13-17, 1980, in Sioux Falls, South Dakota, were formalized at meetings in Golden, Colorado. The Technical Program will consist of six technical sessions to be held in the mornings and afternoons on Monday, Tuesday, and Wednesday (April 14, 15, 16). Also, plans for exhibits, breakfasts, luncheons, and banquets, audiovisual requirements, transportation, registration, information, and EDC tours were discussed.

Geosat Board of Directors Meeting: An EDC representative attended the Geosat Committee Board of Directors meeting in Denver. Business discussed included: 1) announcement of the 1980 Geosat Board of Directors elected by the membership, 2) review of the 1979 Geosat activities and accomplishments, 3) outline of Geosat's goals for 1980, 4) the longevity of Geosat and the need to restructure the mechanism for financing Geosat, and 5) the need to hire a full-time Program Coordinator for the Geosat/NASA Test Case Program. The next meeting of the Board of Directors will be held in Sioux Falls in conjunction with the Sixth Pecora Symposium.

Anchorage Digital Analysis System: Acceptance testing of the USGS/EROS Field Office IDIMS Series III digital image analysis system was conducted at ESL, Inc., Sunnyvale, California, during February 19-21, 1980. The IDIMS Series III system is being purchased for the USGS under a joint contract administered by the Bureau of Land Management, Denver, Colorado. Tests for each hardware/software component of the system were successfully completed. Because of minor component failures, it was necessary to conduct several tests of the Telex 6250/1600 bpi tape drives and DeAnza display system. The digital image analysis system will be dismantled and shipped to Anchorage, Alaska, for installation in the USGS/EROS Field Office. After installation is completed, the IDIMS Series III system will be retested for acceptable performance. The retesting is tentatively scheduled to be conducted during the week of March 17, 1980.

Geo-hydrological Research: EDC Geoscience personnel worked with a geohydrologist from the Kansas Geological Survey to analyze Landsat data of northeastern Kansas on the Image-100. The purpose of this research was to enhance linear and curvilinear soil patterns which may relate to the surface expressions of buried alluvial valleys. Interpretations of the spatial locations of buried alluvial valleys on the number of enhanced subscenes will be tested this summer through drilling and geophysical techniques.

Society for Range Management Meeting: An EDC bioscientist attended and co-chaired a session entitled, "Modelling in Range Science" at the annual meeting of the Society for Range Management in San Diego, California. Revegetation and conservation were topics of discussion with range biologists from the Kuwait Institute for Scientific Research (KISR). The Kuwait government is currently investigating the establishment of their own remote sensing center. Range managers from the U.S. Forest Service Regional Office in San Francisco expressed interest in cooperative work with EDC.

U.S. Forest Service/EDC Cooperative Project: Effort continued on the U.S. Forest Service/EDC Cooperative Project which will involve automatic scanning of U-2 optical bar aerial photos and the analysis of the resulting digital data. A tape of scanner data from the Forest Service Pacific Southwest Forest and Range Experiment Station was received and assessed for project suitability using the IDIMS system. Final products will include forest-stand type maps.

Optronics C-4300HS Film Recorder: The optronics color film recorder (Model 4300) was accepted this month. A photoscientist checked the system for geometric and radiometric fidelity to the specifications and reported excellent geometric accuracy in the placement of pixels. This system will reside at EDC for six months for experimental testing and then will be shipped to the EROS Alaskan Field Office for permanent

installation. The system consists of the drum recorder, 1600 bpi tape drive, and a computer built by Computer Automation, Inc.

MSS/RBV Merging Project: Work continued on the Multispectral Scanner/Return Beam Vidicon Merging Project in the Data Analysis Lab. Progress included the creation of a false color composite for the San Francisco urban area using percent reflectivity as a brightness mask. Future work will include the generation of an optronics false color composite displaying this technique plus two other techniques currently being tested.

NASA ASVT Review: EDC participated on a panel to review and evaluate current and proposed NASA Applications System Verification and Transfer (ASVT) projects at the request of NASA Headquarters. Seven on-going and four proposed projects were discussed, and the review panel was asked to quantitatively evaluate the proposed projects on a number of criteria including: 1) user need and justification (i.e., does it reflect current national priorities, is there potentially a large-scale market for the information, would there be a positive long-term economic impact); 2) user commitment (i.e., does the proposed cooperating user intend to use the technique operationally and will it commit significant resources to the ASVT work); 3) high probability of success; 4) definite end-point for NASA involvement; 5) soundness of technical and managerial plan; 6) industrial sector involvement; and 7) plans for benefit evaluation and project documentation.

NOAA Land Remote Sensing Task Force: EDC continued to support the NOAA Land Remote Sensing Task Force which is preparing the transition plan for Civil Land Remote Sensing. Specific support included participation in the Systems Concepts, Interim Ground Segment, and Policy Working Group meetings. Also, draft chapters of the transition plan have been reviewed and comments provided to the Policy Working Group.

LGSOWG CCT Configuration Control Board Meeting: EDC participated in the third Landsat Ground Station Working Group (LGSOWG) CCT configuration Control Board meeting held in Frascati, Italy. The meetings are held for the purpose of standardizing the CCT format for all the Landsat ground station processing facilities. The agenda included: review of proposed changes to the standard format; review of ground control point processing at each site; and other items of interest common to CCT distribution facilities and users.

Alaskan Activity: Approximately 116 visitors made use of the facility in Fairbanks during this reporting period. George Ludwig, Director of Operations of the National Environmental Satellite Services at NOAA visited the Geophysical Institute and after touring the facility he gave a special seminar on the NOAA operational satellite systems and the data flow for polar and geostationary satellites. Copies of data from several of these satellites are archived here, and the opportunity to meet Dr. Ludwig and discuss both present-day and future plans of NOAA was appreciated. John Miller traveled to Anchorage to attend a seminar on the new Alaska Land and Resources System recently installed

for the Department of Natural Resources by Comarc Design Systems. Following the two-day seminar, he also attended a meeting of the Task Force on Remote Sensing. The planning team for the Delta Land Management Planning Study met to reevaluate a land use plan they had drawn up several years ago for a 1.5 million acre area near Delta. The facility provided a mosaic constructed from the most recent high altitude aerial photographs along with Landsat enlargements of much of the area to aid their reevaluation.

EROS Data Center Monthly Activity Report March 1980

DATA PRODUCTION AND SALES: Shipped reimbursable sales amounted to \$1,803,000 for the first six months of FY 1980, running 4.3% ahead of the fiscal year plan. March's shipped sales totalled \$341,000. Current work-in-process is \$121,000. Also, there are \$212,000 in retrospective CCT's on order to NASA/Goddard.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): Approximately 800 scenes of MSS data were received at EDC this month; however, little or none of that was added to the main image file. Serious problems were encountered, beginning in mid-February, with the processing systems at Goddard Space Flight Center. Problems began with the increased frequency of occurrence of the line start anomaly aboard the spacecraft. During attempts to compensate for this problem, other system failures occurred, complicating the resolution of the failure. As of the end of March, the system has not returned to production status. The backlog now consists of approximately half of February's data (1,000 scenes), that were processed incorrectly and require reprocessing, and all of March's acquisition. RBV data is available only in limited quantities of engineering data totaling less than two hundred scenes. Although earlier production target dates stipulated RBV production startup in March, it now appears that May 1 is a more realistic date.

INORAC SYSTEM MODIFICATIONS: Recent INORAC improvements were implemented to allow added capabilities for the NCIC remote terminal installations. The system now allows temporary storage of financial and production reports, generated via batch routines overnight, then automatic routing of those reports to the remote installations with startup of the terminal network the next day. This feature is expected to significantly improve the capability of the NCIC office to manage its production activity.

EDIPS UPGRADE CRITICAL DESIGN REVIEW: On March 20-21, the TRW contract to modify EDIPS for the "A" tape interface from NASA was discussed at the Critical Design Review. The system mods appear to be well designed, and system integration is expected to begin at EDC by September 1, 1980. The "A" interface will then move into production status in mid-January 1981.

PECORA VI SYMPOSIUM PLANNING: On March 13-14, the Society of Exploration Geophysicists convention manager met with EDC personnel to complete detailed planning for the April 13-17 Annual William T. Pecora Symposium. The technical program, running from Monday morning to Thursday afternoon, lists many papers and presentations dealing with the specifics of integrating remote sensing and the exploration process. Highlights for the week include wine and cheese poster sessions, a kickoff luncheon, and the Pecora Award banquet.

ACSM TECHNICIANS WORKSHOP: On March 12, an EDC scientist and members of the Bureau of Land Management's Denver Federal Center staff co-instructed an image interpretation workshop at the ASP/ACSM Annual Convention in St. Louis, Missouri. The one-day intensive workshop was designed for ACSM surveying and mapping technicians. It emphasized concepts and principles of image interpretation and applications of remote sensing for inventorying, mapping, and monitoring natural resources. Fifty technicians attended the workshop and information was presented on types of platforms, sensors and data; advantages/disadvantages of remote sensing; stereoscopy; image geometry/measurements; and interpretation and mapping procedures/equipment.

WASHINGTON STATE UNIVERSITY/WASHINGTON DEPARTMENT OF GAME/EROS DATA CENTER—POSSIBLE COOPERATIVE PROJECT: Two EDC staff members visited with personnel from the Washington Department of Game, NASA, and the Pacific Northwest Regional Commission in Olympia, Washington. The purpose of the meeting was to provide assistance to the Washington Department of Game in planning a wildlife habitat inventory project using Landsat data and Washington State University's computer facilities.

CONTINUING WORK ON AVRI ACCURACY ASSESSMENT: An EDC bioscientist traveled to Phoenix, Arizona, to meet with Kenny Aerial Mapping personnel. This aerial mapping firm is collecting aerial photography to be used in the ground resampling stage of the accuracy assessment of the Arizona Vegetation Resource Inventory (AVRI) cooperative project between the Bureau of Land Management and the EROS Data Center. Kenny Aerial Mapping was presented with 67 quad sheets containing 96 flight-lines. Additional discussions were conducted regarding project requirements.

MSS/RBV MERGING PROJECTS: EDC personnel have completed comparison of registration products generated by the General Image Processing System (GIPS) and Interactive Digital Image Manipulation System (IDIMS). A transformation and subsequent registration of MSS and RBV data have proven to be accurate to less than a single pixel of error. GIPS error was found to be on the order of several pixels. Two possible sources of error will be investigated to improve the GIPS registration capabilities.

FOREST FIRE FUELS MAPPING PROJECT: Two EDC scientists traveled to Missoula, Montana to review the status of the Forest Fire Fuels Mapping Project with cooperators from the U.S. Forest Service's Northern Forest Fire Laboratory (NFFL). Both EROS and NFFL groups have been independently conducting statistical analyses of a spectral terrain, a vegetation, and a fuels data set established in earlier project efforts. The analysis effort has concentrated on using terrain variables within spectral clusters to separate fire fuel types and tree species. NFFL scientists have investigated the use of a logistic response function which is developed from multiple regression techniques where the dependent variable is the probability of occurrence and the independent variables are terrain variables. EROS scientists have been using linear discriminant analysis to investigate the relative importance of terrain variables for distinguishing fuel types within spectral clusters. During the review session, analysis approaches were discussed, and analysis plans were made to bring the project to completion in FY 1980.

VISIT BY AGRISAT COMMITTEE: Several senior members of the Research and Development Division of Farmland Industries, Inc. (Kansas City, MO) visited the Data Center to exchange views on the need for an action committee within the agricultural private sector. This committee would serve as a counterpart to the Geosat Committee. Its purpose would be to provide a uniform voice to the remote sensing community in matters of agribusiness and production agriculture. The Farmland Industries team is currently visiting selected remote sensing centers and major agribusinesses in order to formulate a working plan for such an organization. Following their fact-finding mission, they will prepare a draft mission and organization statement for further discussion.

PACIFIC NORTHWEST RANGE MANAGEMENT SHORT COURSE: An EDC bioscientist presented a lecture and photo interpretation exercise at the annual Pacific Northwest Range Management Short Course at McNary, Oregon. The course was sponsored by Oregon State University. This year the course was entitled "Remote Sensing Applications for Resource Evaluation." The lecture fulfilled one of four topics discussed and addressed the interpretation of color infrared aerial photographs. Supplementing the lecture was an EDC workshop exercise entitled "Measurement of Rangeland Plant Parameters and Vegetation Change Using Very Large-Scale Color Infrared Photographs." The workshop was attended by approximately 100 Federal and State personnel. Other topics discussed at the short course were: (1) acquisition and use of 35mm photographs, (2) forage production estimations, and (3) range condition and trend analysis.

MSHA REMOTE SENSING PROGRAM: The Roof Control Branch, Division of Safety Technology of the Mine Safety and Health Administration (MSHA) is implementing a program to operationally use remote sensing to detect geologic features which could potentially offset mine safety. The Roof Control Branch recently held two workshops at its Technical Support Center near Pittsburgh, Pennsylvania. Included were staff members of the various Coal Mine Safety and Health district offices who are directly involved in the monitoring and investigation of ground stability problems. Two EDC geologists participated separately with MSHA personnel in the presentation of these three-day workshops. One additional workshop is scheduled to be held in Denver in May, and a week-long training course for MSHA personnel to be held at EDC is being planned for late summer.

USGS/CHINA SCIENTIFIC RESEARCH INSTITUTE FOR PETROLEUM EXPLORATION AND DEVELOPMENT—COOPERATIVE EFFORTS: A document outlining EDC ideas for future cooperative efforts between the U.S. Geological Survey and China's Scientific Research Institute for Petroleum Exploration and Development was sent by EDC management to the Office of International Geology. It is to be included in a coordinated China program which OIG will present for consideration to the Department of Interior, other governmental agencies, and the Chinese. The proposed work is to involve continued efforts in the Tsaidam Basin of western China as well as new studies of the Tibetan plateau region. These cooperative efforts will investigate the applications of remote sensing to petroleum exploration in these vast, remote regions of China and will likely continue through at least FY 1984.

NOAA LAND REMOTE SENSING TASK FORCE: EDC continued to support the NOAA Land Remote Sensing Task Force which is preparing the transition plan for Civil Land Remote Sensing. Specific support included participation in the Systems Concepts, Interim Ground Segment, and Policy Working Group meetings. Also, second-draft chapters of the transition plan have been reviewed with comments provided to the Policy Working Group.

USGS/EROS FIELD OFFICE-ANCHORAGE: Two EROS Data Center personnel were transferred to Anchorage, Alaska in early March to begin operation of the USGS/EROS Field Office. The IDIMS digital analysis system was installed on schedule during the last week of March. Major potential users of the Anchorage facilities and services include: Bureau of Land Management, State Office; Division of Research and Development, Department of Natural Resources; Subcommittee on Vegetation Classification and Description; Subcommittee on Natural Resource Information Management (CONRIM); and Alaska Planning Group, USGS.

GEOLOGICAL REMOTE SENSING WORKSHOPS: Two Geological Remote Sensing Techniques Workshops were given at EDC during the weeks of March 10-14 and March 17-21. Participants from Federal, State, and industrial organizations attended the introductory course and most participants attended the Digital Techniques Course. Both workshops emphasized the concepts, principles, and applications of remotely sensed data to geological investigations through relevant lectures and exercises.

FAST-CLASSIFIER PROJECT: Preliminary work was begun on a project which will potentially result in speed and accuracy improvements to existing digital classification techniques. A cooperative project with the Flagstaff Computation Branch of the USGS has been designed to investigate potential efficiencies in the use of spatial information (edge gradients) before or during classification. It is felt that classification accuracy may be improved with the inclusion of spatial information. Further, it may be possible to avoid the rigorous quadratic calculation in areas of high homogeneity, as indicated by low spatial gradient.

EROS APPLICATIONS ASSISTANCE FACILITY-FAIRBANKS: During this reporting period 132 visitors made use of the services and facilities at Fairbanks. Tom George gave a lecture and slide presentation on the use of 35mm CIR photography at a meeting with the Pipeline Coordinator's Office. Attending were representatives from the Department of Environmental Conservation, Department of Fish and Game and USA/CRREL. John Miller served as chairman of a discussion group at the NOAA/NESS conference in Seattle on the U.S. Operational Land Remote-Sensing Satellite Program. He also submitted a written report, to the Director of NESS, documenting the applications and benefits of real-time Landsat images for Alaska.

EROS APPLICATIONS ASSISTANCE FACILITY-NSTL STATION, MISSISSIPPI: During March 127 visitors obtained information or assistance at the NSTL office. Twenty-seven people attended a successful conference sponsored by the AAF and the Virginia Polytechnic Institute on March 4-5. There will be a paper written documenting the concensus of the conference. A U.S. Forestry Workshop was held involving a classroom exercise to reinforce instruction in forestry applications of color infrared photography. The U.S. Forest Service flew a special mission of color infrared photography in the local area.

EROS Data Center Monthly Activity Report April 1980

DATA PRODUCTION AND SALES: FY 1980 shipped sales through April amounted to \$2,148,503, which is \$116,502 or 5.7% ahead of the budgeted plan to date. Shipped sales for April amounted to \$345,032, which is the highest amount ever shipped for April. Incoming sales of \$320,817 comprise the highest amount ever ordered for the month of April. Total Work-In-Process is \$299,054, a decrease of 10% from March. Retrospective CCT's on order to NASA/Goddard amounted to \$206,400, or 69% of the total WIP. Increasing concern is being made evident by users over the lengthy delay associated with retrospective CCT's.

EROS DIGITAL IMAGE PROCESSING SYSTEM: More than 1700 scenes of MSS data were received at EDC this month, somewhat below the average monthly workload. At the beginning of the month, the processing systems at the Goddard Space Flight Center were not in a production mode. Although no official notification has been received from Goddard, workload received at the end of the month indicates that Goddard is back in a production status. problems experienced in February through April will require reprocessing of almost 2000 MSS scenes, both at Goddard and EDC. About 100 of those have been received so far. Small amounts of RBV test data were received this month. Although the data appeared to process well, the limited quantity available does not allow full confidence in EDIPS for RBV production. attempted to process, in a test mode, a full month's worth of RBV data (approximately 600 scenes). Of this amount, 70 scenes were successfully processed and sent to EDC. GSFC will now reanalyze that data and attempt to reprocess it, again in test mode. This indicates that the RBV production start-up target date will be delayed at least until the end of June.

INORAC MODIFICATIONS: Phase I of the historical CCT ordering system has been completed. It allows the selection, editing, and ordering of Landsat historical CCT's from GSFC. Phase II will enable the receipt, accounting and entry of these CCT's into the data base. This system will replace the manual tracking system currently in use. Enhancements have been completed to allow ordering of edited HDT products through the standing request system, although HDT products will not be available from EDIPS until after completion of the TRW upgrade to EDIPS. Also, a tiered pricing structure has been incorporated into the ordering system to meet NHAP requirements.

PECORA VI SYMPOSIUM: Approximately 480 people registered for the April 13-17 Sixth Annual Pecora Symposium and Exposition, sponsored by the Society of Exploration Geophysicists, in conjunction with the U.S. Geological Survey/EROS Data Center, the American Association of Petroleum Geologists, the Geosat Committee, and the National Aeronautics and Space Administration. The theme of Integration of Remote Sensing into the Exploration Process sparked heavy attendance and active participation in technical sessions, poster sessions, workshops, and a pre-symposium short-course in remote sensing. Nearly 300 attendees visited EDC for special tours. Scientists

from EDC gave presentation or poster sessions on: "The Landsat Satellite System;" "Considerations for Integrating Data Obtained from Various Remote Sensors;" "Generation of Stereo High-Resolution False Color Composites Using Landsat, Topographic and Aeromagnetic Data;" "Landsat Data Products from EROS Data Center;" "The Application of Landsat Images to Hydrocarbon Exploration in the Tsaidam Basin, China;" "Future Hardware and Software in Digital Image Processing;" and "Techniques for Integration and Display of Landsat Topographic and Geophysical Data."

FRENCH VISIT: A French delegation consisting of Mr. Jean-Claude Cazaux (CNES), Manager SPOT Data Management and Processing System; Mr. Andre Fontanel (IPF), Project Manager SPOT User Services Project; Mr. Gilbert Saint (CNES), Thematic Research Group (Agronomy, Water Management) Toulouse Space Center; and Mr. Gilbert Weill (CNES), Head Earth Observation Department Headquarters visited EDC April 18, 1980, for the purpose of understanding EDC's Landsat Data Processing, Cataloging, and Information Systems and Applications Research and Technology Transfer Activities; to provide a SPOT Program Update to EDC personnel; and to generally discuss special topics.

RANGE COMMANDERS COUNCIL/OPTICAL SYSTEMS GROUP MEETING: The EDC Photographic Laboratory hosted the Range Commanders Council/Optical Systems Group 65th Meeting. The Group's purpose is to transfer technology, solve mutual technical problems, consolidate purchases when appropriate, and transfer surplus equipment.

FWS COOPERATIVE PROJECT CONTINUATION: Three EDC bioscientists travelled to Stillwater, Oklahoma to perform field work in conjunction with a cooperative project with the U.S. Fish and Wildlife Service. The field work was undertaken to assess the accuracy of land cover maps produced from digital classification of Landsat data for evaluating prairie chicken habitat. Field surveying techniques were used to locate ground areas corresponding to sample blocks of Landsat pixels which had been plotted onto topographic maps by a computer-driven flatbed plotter. Pixel blocks were satisfactorily located and assessed using this innovative technique. Classification accuracy is now being calculated from this field data.

REMOTE IMAGE PROCESSING SYSTEM: Components for the Remote Image Processing Station (RIPS) have begun arriving in the DAL. The main controller and chassis have been assembled and tested and are now operational. They are currently functioning as a communications device under control of a software monitor from CROMEMCO. Delivery of the disk controller and video output stages is expected soon, at which time further expansion is planned.

DIGITAL BLACK HILLS MOSAIC: EDC personnel used the IDIMS to test results of a digital mosaic of the Black Hills. The mosaic was created by compositing two scenes along a Landsat path. Both scenes were EDIPS generated. Ground control points were applied and software using the tick mark annotation reprojected the images from a Hotine Oblique Mercator (HOM) projection to a Universal Transverse Mercator (UTM) projection. The UTM projected images were then mosaicked.

EDC/FOREST SERVICE COOPERATIVE PROJECT: Work continued on the U.S. Forest Service/EDC Cooperative Project with a visit from personnel of the U.S. Forest Service Pacific Southwest Range Experiment Station. Forest Service scientists and EDC staff applied several image classification approaches to scanning data from U-2 optical bar aerial photographs. The Image 100 and IDIMS were utilized. The maximum likelihood classifier of IDIMS successfully differentiated between conifer and hardwood trees in one of two images. The second image is still under analysis.

AVRI FOLLOW-ON WORK: An EDC bioscientist worked with Bureau of Land Management personnel in Denver, Colorado to develop digital land cover maps of the Grand Wash Planning Unit, Arizona Strip District Northeast Arizona. The cooperative work was a portion of the follow-up, accuracy assessment of the Arizona Vegetation Resource Inventory (AVRI) project. This recent effort with BLM personnel resulted in the re-aggregation of the 83 computer vegetation classes to form eleven broad vegetation types. New and more useful color vegetation-cover maps will be produced. A subsequent phase of the AVRI project, field data collection to be conducted in May, was also discussed.

AAG REMOTE SENSING WORKSHOP: An EDC applications scientist travelled to Louisville, Kentucky to participate as a course instructor in the eighth annual Association of American Geographers (AAG) Remote Sensing Workshop. The two-day workshop covered the fundamentals of remote sensing and concluded with applications examples and hands-on exercises. Sixteen university faculty members from various locations around the United States attended the workshop which preceded the annual meeting of the AAG.

IDIMS UPGRADE: The IDIMS image analysis system in EDC's Data Analysis Laboratory has been upgraded to a Series III configuration. Hardware and software components were delivered by contractor ESL, Inc. Installation has been completed and acceptance testing is underway. In the upgraded configuration, IDIMS consists of an HP 3000, Series III mini-computer, two 6250/1600 bpi tape drives, two 120 megabyte disks, two Comtal image display subsystems, a Graf/Pen digitizer, an array processor, two graphic terminals and associated output devices. The addition of core memory, disk storage and an array processor provides a significant increase in operational efficiency of the IDIMS.

NASA APPLICATIONS PILOT TEST: An EDC applications scientist participated in a NASA-sponsored peer review of the NASA Applications Pilot Test (APT) "Irrigated Lands Assessment for Water Management." The review, conducted in Berkeley, California, provided an opportunity for both NASA administrators and a panel of non-involved scientists to offer comments and suggestions regarding the technical procedures being carried out by the University of California group conducting the project. The APT is primarily concerned with the development of an operational procedure to estimate the area of irrigated land in the entire state of California.

EROS FIELD OFFICE-ANCHORAGE: Activities in April were focused on informing resource management agency personnel of the proposed Field Office activities and policies, and conducting demonstrations of the IDIMS system for: Bureau of Land Management; Geologic Division, USGS; Soil Conservation Service; Union Oil Company; Water Resources Division, USGS; and, for Jerry Gilliland, Special Assistant to the Secretary, DOI, and his assistant, Ron McCoy. Field Office hosted the monthly meeting of the Subcommittee on Natural Resource Information Management (CONRIM). Members were given a tour of the Field Office facility and a demo of the IDIMS system's capability. Personnel from the Field Office travelled to the Geophysical Institute, University of Alaska, Fairbanks to (a) meet with remote sensing personnel, (b) see the facilities, and (c) learn about the remote sensing activities and services of the Geophysical Institute and EROS Applications Assistance Facility. Discussions focused upon opportunities for cooperation and interaction between the Field Office and the Geophysical Institute Remote Sensing Program.

EROS APPLICATIONS ASSISTANCE FACILITY-NSTL STATION, MISSISSIPPI: A Louisiana State University Advanced Remote Sensing class consisting of 15 students visited the photo-optical laboratory to utilize equipment in connection with their class projects. Additional users of the laboratory have been South Central Bell Company, the New Orleans Planning Commission, Educational Planners, Inc. and investigators from the Department of Energy. Activities included land use photo interpretation, image enhancement and image mensuration. Other visitors this month have included representatives from the following organizations: Louisiana Geological Survey, Delta Exploration Company, Navajo Tribe, Navoceano, USM, and the University of New Orleans. The major activity was the Naval Foreign Officers' Workshop which accounts for 96 training hours. There were 14 attendees including Naval personnel from USA, Egypt, Portugal and Nigeria. A Wetlands Mapping Workshop is scheduled for mid-May for the U.S. Fish and Wildlife Service if Federal travel permits.

EROS APPLICATIONS ASSISTANCE FACILITY-INTERAMERICAN GEODETIC SURVEY: A remote sensing course was recently conducted by Dr. Robert Frost, Dr. Jack Rinker, Dr. Luis Bartolucci, and Lawrence Goldstein at the IAGS Cartographic School. Eighteen students from five countries attended.

EROS Data Center Monthly Activity Report May 1980

DATA PRODUCTION AND SALES: FY 1980 shipped sales through May amounted to \$2,463,233 which is 6% ahead of the budgeted plan. Incoming reimbursable orders came to \$2,448,728 or 5.4% ahead. Total Work-In-Process for May amounted to \$330,977 with 63% or \$208,400 representing retrospective CCT orders from NASA/Goddard Space Flight Center.

EROS DIGITAL IMAGE PROCESSING SYSTEM: Approximately 2800 scenes of MSS data were received this month. Almost 80 percent of that data is seriously affected by the failure of the MSS sensor line start synchronization. Frequency of this anomaly has increased dramatically since about January, resulting in the installation of a hardware correction device inserted in the MSS data stream in mid-February. That change in configuration caused significant data problems, in addition to the line start anomaly, in March and April and problems continued throughout this month. The scenes that are properly corrected by the hardware fix still exhibit a loss of as much as one-third of the data in the scene. EDC is currently investigating means of indicating this data loss through a parameter in the data base, so that user inquiry responses can properly indicate the affected scenes.

FOURTEENTH INTERNATIONAL REMOTE SENSING WORKSHOP: The Fourteenth International Remote Sensing Workshop was held in May. Nine scientists, representing six countries, and representatives of the Department of Defense, South Dakota State University, and the EROS Data Center participated in the workshop. As in the past, emphasis in the workshop was placed on manual analysis of remotely sensed data for resource management problems. Lectures, field trips, exercises and lengthy study of imagery over participants' study areas helped the students to see the advantages and limitations of satellite remotely sensed data.

MSHA REMOTE SENSING WORKSHOP: An EDC scientist travelled to Denver, CO to present the opening day lectures at the Mining Safety and Health Administration's (MSHA) Remote Sensing Workshop, held on May 13 and 14. This was the third in a series of introductory workshops held for MSHA personnel in which EDC scientists have participated. Lectures concentrated on remote sensing platforms (satellite and aerial), an overview of the Landsat system, high-altitude photography, side-looking airborne radar, and accessing and ordering data products. The workshop was well attended by both Denver and Utah MSHA personnel.

U.S. FISH AND WILDLIFE COURSE: The eleventh in a series of remote sensing applications training courses for U.S. Fish and Wildlife (FWS) personnel was held at NSTL Station, Mississippi. The four and one-half day course was jointly taught by personnel from EDC and the EROS Applications Assistance Facility at NSTL. The course, with sixteen participants, emphasized the interpretation of color infrared aerial photographs (3 scales) and Landsat images for wildlife habitat mapping. The FWS National Wetland Inventory (NWI) classification framework was utilized in the exercises, and related presentations were made by the NWI regional coordinator from Atlanta. A one-day field trip to forested wetland and marsh areas allowed attendees to verify interpretations and discuss the application of the NWI system. An overview of Landsat digital image processing was also presented.

EDC UNIVERSITY GRANT PROGRAM: The University Grant Program, intended to provide funds to universities for the development of curricula and materials for training resource professionals in remote sensing, is currently in the proposal evaluation phase. Technical evaluations of all proposals have been made and the budgets of certain proposals are now being negotiated. Those who submitted unacceptable proposals were to be notified by May 30 and awards to the successful proposers will be made on or about July 1.

COLUMBIA RIVER PROJECT: EDC personnel recently met in Portland, Oregon with U.S. Army Corps of Engineers staff to discuss progress of the Columbia River and Tributaries Irrigation Withdrawals Analysis Project. The initial project task, an estimate of irrigated acres and changes in irrigated lands between 1973-1979 in the Umatilla Basin, Oregon, is nearly complete. This task uses Landsat imagery to map irrigated lands for several dates. A two-stage sampling procedure is now being used to refine the accuracy of the interpretations and acreage figures. The status of the digital classification of irrigated crop types was also reviewed. An approach to deriving accurate crop type acreages by township was selected and will soon be implemented. Corps personnel were also briefed on their role in the completion of the remaining project tasks, including identifying future irrigation areas, estimating pump lifts from the Columbia River to the irrigated lands, and calculating water requirements for irrigated croplands.

MASS STORAGE SEMINARS: The first in a series of EDC sponsored mass storage seminars was held this month with RCA Advanced Technology Laboratories presenting the "RCA Archival Optical Disk Data Storage System."

IDIMS UPGRADE: The Data Analysis Laboratory upgrade of the IDIMS system to a Series III model was completed on May 12. The upgraded image analysis system includes the addition of two 1600/6250 bpi tape drives, 1024 kb of memory, two 120 mb disks for user image storage and an array processor with its own CPU and memory. The speed of computational throughput has increased by as much as 15 times.

REMOTE IMAGE PROCESSING STATION PROJECT: Several developments have recently occurred in this project. The LIGMALS/B software package has been obtained from the University of Michigan to operate as a support host for the initial hardware evaluations of the number one prototype terminal unit. The number one terminal prototype has reached a level of completion sufficient to permit generation of black-and-white and color test patterns on the video display under control of the inboard microprocessor. Hardware driver routines have been generated to permit the current level of testing on this device. Deliveries of communications hardware are expected shortly, at which time actual images generated on a host system should be displayable. Transfer tapes of San Francisco and Mt. St. Helens are being prepared for this task.

EROS FIELD OFFICE-ANCHORAGE: EROS personnel hosted the May meeting of the Alaska Land Managers Cooperative Task Force in the Field Office facilities. At the conclusion of their meeting, Task Force members received a briefing on Field Office assistance activities and a demonstration of the digital analysis equipment. The 30 participants at the Task Force meeting represented the U.S. Department of Agriculture (USFS, SCS); the Department of Interior (BLM, FWS, NPS, BIA, and USGS); Alaska State Agencies (Department of Fish and Game, and Heritage Conservation and Recreation Service); the Army Corps of Engineers, and Alaska Federation of Natives. EROS and National Park Service (NPS) personnel commenced work on a cooperative project involving the digital classification of cover types on Landsat data for a small portion of the Wrangell-St. Elias National Monument. The objectives of the study are to develop demonstration/training materials for National Park Service personnel, and to train NPS personnel to use the IDIMS system.

EROS APPLICATIONS ASSISTANCE FACILITY-FAIRBANKS: At the request of the Alaska Division of Emergency Services (ADES), the Fairbanks facility again instituted the acquisition of near real-time Landsat images by facsimile transmission from the Canadian ground station in Prince Albert, Saskatchewan. The "quick-look" Landsat images were used to assist the surveillance of the breakup of the Yukon River. One hundred ten users visited or telephoned for assistance this month. Additionally, over one hundred school-age youth visited on tours.

EROS APPLICATIONS ASSISTANCE FACILITY-NSTL STATION, MISSISSIPPI: Dr. A. Narain of the Indian Bureau of Commercial Fisheries, interested in remote sensing activities, visited the Applications Assistance Facility. The equipment in the Photo-Optical Laboratory was used by Mr. Tom Lemming of NMFS to demonstrate its effectiveness for menhaden school location and mensuration for tonnage estimates. During this month people from the following institutions and agencies worked on specific equipment in the Photo-Optical Laboratory: Jackson County Planning Commission, Cotton Inc., Louisiana Land and Exploration Company, Rapides Planning Commission, Crown Zellerbach South Branch Timber Company, Humboldt State Univeristy, Texaco Inc., Bennet and Peters, Inc. (Consulting Foresters), PPG Industries University of Virginia, NAVOCEANO/NSTL, and Shell Oil Company. The instruments most heavily used were the H. Dell Foster Digital Planimeter, Krones Transcop, and Kargl Rectifying Projector. Assistance was provided specific users regarding salt dome analysis, land susbsidence, and selection of fluvial geomorphology examples for university lecture material.

EROS Data Center Monthly Activity Report June 1980

DATA PRODUCTION AND SALES: FY 1980 shipped sales through June amounted to \$2,813,482 which is 7.6 per cent ahead of the budgeted plan. The June total was \$350,249. Total Work-In-Process for June was \$275,503 with 56 per cent or \$155,500 representing CCT orders from NASA/Goddard Space Flight Center where the CCT backlog is currently being worked off at an increasing rate.

EROS DIGITAL IMAGE PROCESSING SYSTEM: Approximately 3,700 scenes of MSS data were received and processed this month. Currently, more than 8,600 scenes remain in backlog status at Goddard with 3,200 scenes of new data acquired this month. No production RBV data has been received, although a few scenes of engineering data are being processed. EDIPS has processed these limited quantities of RBV in acceptable fashion. The most recent date for expected startup of RBV processing is August 1980.

MASS STORAGE SEMINARS: The second in a series of EDC-sponsored mass storage seminars was presented this month by IBM, featuring the IBM 3850 Magnetic Cylinder Mass Storage System.

AGRISTARS DATA MANAGEMENT TEAM MEETING: EDC participated in the first meeting of the AgRISTARS Data Management Team held at NASA/JSC June 18-19, 1980. The intent of the meeting was to provide an information exchange between AgRISTARS data users and data sources and resolve any problems that may exist. Representatives from each of the eight AgRISTARS projects discussed their data requirements, and representatives from Agriculture, NOAA, NASA, and Interior discussed data availability and procedures for obtaining data.

MAGSAT RESEARCH PROJECT: An EDC research project is underway which involves the analysis of Magsat data in the interpretation of signatures characteristic of a particular tectonic province or type of province. Conventional geophysical data suggested that magnetic data acquired from a spacecraft may be useful in studying areas where land-based magnetic data is unavailable. Thus, Magsat, launched in 1979, was developed to provide a perspective of the Earth's terrestrial magnetic field. This research project will concentrate on West Africa and eastern South America and the collection of all available ground and airborne geological, geophysical, and mineralogical data for synthesis with Magsat data. The primary project objective is to develop a better understanding of the regional geophysical setting of the study area and to determine what techniques are most useful.

SIOUX FALLS AREA GEOGRAPHICAL ANALYSIS: The Sioux Falls Area GeographicAnalysis (SAGA) is a cooperative demonstration project addressing current land planning problems in and around Sioux Falls, South Dakota. Cooperators include planners from the City of Sioux Falls, two local counties, and the EROS Data Center. Aerial photographic interpretation and geographic information system techniques will be combined and applied to four current planning efforts: (1) conduct a land use inventory;

(2) map rural areas' suitability for urban growth; (3) determine water runoff problem areas; and (4) map changes in urban tree canopy cover. Expected end products will be in the form of maps, statistical tables, documentation, and local briefings when appropriate. Completion is scheduled for February 1981.

MT. ST. HELENS: EDC scientists are addressing the recent Mt. St. Helens volcanic eruptions and the subsequent environmental impacts in several ways: (1) numerous State and Federal land-managing agencies in the Pacific Northwest have been contacted to discuss mutually beneficial data and projects; (2) pre-eruption remotely sensed data of many formats are being screened for the highest quality data over the volcano and the surrounding area; (3) post-eruption remotely sensed data, particularly Landsat, are being carefully monitored as they become available; and (4) work has begun to produce an enhanced mosaic of Landsat data which will be merged with digital terrain data to produce stereo images of Mt. St. Helens before and after the eruptions. This work is of special interest to the U.S. Forest Service, Portland, Oregon, and a cooperative effort may emerge.

EDC/USFWS COOPERATIVE PROJECT IN NORTH DAKOTA: Discussions are being held between EDC and USFWS personnel concerning the potential role of Landsat data in the study of sunflower depredation by blackbirds in North Dakota and a project plan has been prepared for review. Objectives of the proposed project include: (1) determine the accuracy with which sunflower fields can be identified and acreages measured on mid-summer Landsat imagery; (2) produce sample output map products and summary statistics for evaluation; and (3) determine cost-effectiveness of the remote sensing technique as compared to alternatives. The project is tentatively scheduled to be completed by December 1980.

PROPOSED DMA TRAINING: EDC personnel met with representatives of the Defense Mapping Agency (DMA) at the Naval Observatory in Washington, DC, on June 18, to discuss DMA remote sensing training needs. DMA management feels that its production charting groups, responsible for mapping shorelines and shallow seas, should make maximum possible use of Landsat data. EDC staff will work closely with DMA to further define their training needs and form an optimum training proposal.

DATA ANALYSIS LABORATORY: Several programs have been developed relating to the Remote Image Processing Station (RIPS) Project. On the Amdahl computer in Michigan, a program has been written to produce RIPS-compatible output from video files. On the RIPS, software has been written to enable the system to perform as an intelligent video terminal. This allows the system to accept data via telephone communication. Three video channels of data may be displayed on a color monitor using newly developed software. Other software development includes the installation of EDC-generated functions on the new IDIMS Series III. A proximal mapping function is also being written for the IDIMS.

LARS SYMPOSIA: Three EDC scientists presented four papers at the annual International Symposia on Machine Processing of Remotely Sensed Data and Soil Information Systems and Remote Sensing and Soil Survey sponsored by the Laboratory for Applications of Remote Sensing (LARS), Purdue University. The papers were entitled: (1) "An Assessment of Landsat Data Acquisition History on Identification and Area Estimation of Corn and Soybeans," (2) "Utilization of Digital Ancillary Data in Satellite Land Use Mapping," (3) "A Software System for the Digital Enhancement and Classification of Multi-Emulsion Photographic Data," and (4) "A Remote Sensing and Geo-Based Information System Approach to the Assessment of Irrigation Development Potential."

CANADIAN SYMPOSIUM ON REMOTE SENSING: EDC personnel participated in the Sixth Canadian Symposium on Remote Sensing held in Halifax, Nova Scotia. The symposium addressed all aspects of remote sensing including the processing and analysis of data with emphasis on operational and proven applications. EDC representatives presented two poster sessions during the symposium, entitled "Detection of Changes in a Coal Surface Mining Area by Ratioing Multidate LANDSAT Digital Data" and "Role of Aerial Photographs in Classification of LANDSAT Data."

EROS FIELD OFFICE-ANCHORAGE: Personnel from the Geophysical Institute, Northern Remote Sensing Laboratory worked on the digital analysis system with Bureau of Land Management personnel (Fairbanks District Office) to classify vegetation cover types within a 1.5 million acre area on the Seward Peninsula. Geophysical Institute personnel were able to classify vegetation cover types from Landsat computer compatible tapes (CCT's) during the one-week period, taking advantage of the computational speed of the new IDIMS system and assistance from Field Office Data Analysts. Geophysical Institute and BLM personnel will field check the preliminary classification during the summer and return to refine cover classifications later in the summer. The Field Office hosted an introductory photo interpretation course conducted by NASA personnel June 16-19. Eleven resource scientists from four State agencies were in attendance (Department of Community and Regional Affairs, Department of Natural Resources, Alaska Department of Fish and Game, and Department of Environmental Conservation). Field Office personnel working cooperatively with National Park Service personnel have completed a preliminary map of vegetation cover in a small area of the Wrangell-St. Elias National Monument. The map was produced using digital analysis of Landsat data.

EROS APPLICATIONS ASSISTANCE FACILITY-FAIRBANKS: Projects underway this year include: (1) development of remote sensing methods for reindeer range inventory; (2) application of radar and infrared airborne remote sensing to geothermal research at Pilgrim Springs, Alaska, and (3) surficial geology of the Susitna-Chulitna River Area, Alaska. The State-sponsored quick look project has been completed. Landsat data from this project was used to predict two flood-related events, discover one forest fire, and monitor other fires. Recent visitor/user activity at the Fairbanks facility has been heavy.

EROS APPLICATIONS ASSISTANCE FACILITY-NSTL STATION, MISSISSIPPI: The EROS Applications Assistance Facility conducted the Environmental Protection Agency (EPA) Region III Management Remote Sensing Workshop, June 16-20, in Philadelphia. Twenty-five scientists participated. Other activities included a conference with personnel from EPA, Dallas, regarding environmental conditions in the Atchafalaya River Basin.

EROS APPLICATIONS ASSISTANCE FACILITY-INTER AMERICAN GEODETIC SURVEY: Two courses are scheduled for this fall: Theory and Application of Remote Sensing, September 2 through October 3, and Landsat Mosaic Workshop, November 17 through December 5. Lawrence Goldstein, EROS Coordinator, will retire July 26, 1980.

EROS Data Center Monthly Activity Report July 1980

MEETINGS

From July 7 to 17, David Hastings participated in the 26th International Geological Congress in Paris and presented a paper entitled "On the Tectonics and Metallogenesis of West Africa: A Model Influenced by New Geophysical Data." He also met with Dr. M. Bacon and other colleagues in London from July 18 to 21 to discuss correlative data for the Magsat investigation, an on-going research project at the EROS Data Center.

From July 8 to 10, Wayne Rohde and Larry Pettinger met with personnel of the Conservation Division in Menlo Park, California, to discuss future plans for a cooperative project with EDC. The primary goal of the project would be to evaluate the effectiveness of digital Landsat data for gathering environmental information to monitor changes associated with geo-thermal development activities in the Imperial Valley, California.

From July 21 to 25, John Szajgin attended the Multi-Level Sampling Designs for Resource Inventories Workshop at Fort Collins, Colorado. Multi-stage and multi-phase designs were the principal sampling designs discussed.

From July 21 to 25, Scott Holmes, U.S. Army Corps of Engineers, Portland District, visited the EROS Data Center to continue work on the cooperative Columbia River Irrigation Analysis Project.

On July 23, Messrs. Bob Barker and Bud Goodrick of St. Regis Paper Co., Jacksonville, Florida, presented an EROS Data Center noontime seminar on the Forest Resources Information System developed by their company. Emphasis was placed on their experience using Landsat data.

PROJECTS

Arizona Vegetation Resource Inventory (AVRI)

Work has been completed on the initial EDC/Bureau of Land Management AVRI cooperative demonstration project. The BLM has requested an additional set of map products incorporating such variables as scale, aggregation of computer classes, and parameters of the application examples. Plans are to publish results as an Open File Report.

Laboratory of Remote Sensing (LARS)/EROS Data Center Technology Exchange

The technology exchange project between EDC and LARS/Purdue was successfully completed July 1. Three LARS staff members presented a one-day seminar dealing with several aspects of numerical analysis. They also spent 16 hours on the IDIMS exercising several of its interactive capabilities.

Pecora VII

Pecora VII, which is scheduled to be held in October 1981, will be sponsored by the American Association of Geographers. Jim Anderson (USGS/Reston) and Ben Richason (General Chairman) met with EDC representatives July 10 and 11 to select the theme of the symposium, general areas of interest for papers, specific dates, and location in Sioux Falls.

TRAINING

Wildlife Habitat Training Course

Larry Pettinger assisted Dave Carneggie in teaching a July 21 to 25 wildlife habitat analysis training course at the Alaska Field Office in Anchorage. Approximately 18 personnel from the U.S. Fish and Wildlife Service and the Alaska Department of Fish and Game attended.

Jim McCord returned from Tunisia where he was on temporary assignment with the Office of International Geology to give advanced training in the areas of photo science and technology to several Tunisian engineers and technicians. The students are responsible for the national remote sensing program under the direction of the Division of Resources, Water and Soils, Republic of Tunisia.

During July and August, Dr. Jack Bryant, Professor of Mathematics at Texas A&M University, is presenting approximately 10 lectures at EDC on Image Perception and Pattern Recognition.

Mass Storage Seminars

Mass Storage Seminar #3 was conducted for EDC personnel by Harris Corp. Government Information Systems Division on their Mass Archival Storage and Retrieval System (MASTAR).

PRODUCTION

The EDC reimbursable sales projection for FY'80 has been revised from \$3,500,000 to \$3,750,000, primarily due to an increase of EDIPS (EROS Digital Image Processing System) sales, foreign orders, and the increase in delivery of retrospective computer compatible tape orders that are backlogged at the Goddard Space Flight Center.

EROS Digital Image Processing System

Approximately 3,200 scenes of Multi-Spectral Scanner (MSS) data were received and processed in July. Approximately 7,500 scenes of MSS data remain in backlog status at GSFC. Significant quantities of test Return Beam Vidicon (RBV) data are expected during August.

EROS Field Office, Anchorage

Bureau of Land Management personnel used the digital analysis system to commence work on a project which initially involves cover mapping of approximately 4 million acres using Landsat data, but eventually leads to the determination of carrying capacity for reindeer and caribou. The study area is in the Nulato Hills located south and east of Seward Peninsula and east of Norton Sound. Preprocessing of the Landsat CCT's was performed on the BLM digital analysis system in Denver. Training statistics from thirteen sites were produced on the Field Office digital analysis system and line printer maps of the training sites were produced for field evaluation. Training statistics refinement and classification will be performed later in the summer when BLM personnel return from the field.

EROS and National Park Service (NPS) personnel continued work on the cooperative project in the Wrangell-St. Elias National Monument involving the classification of cover types in an area of approximately ½ million acres. Using field data collected in June, analysts concentrated on refining and improving earlier cover classification.

EROS Applications Assistance Facility, Fairbanks

The Geophysical Institute (the University of Alaska contractor for the Applications Assistance Facility) hosted the Committee on Natural Resource Information Management (CONRIM) on June 30. A tour of the scientific laboratories in the Institute was given with an extended time spent in the Assistance Facility. The afternoon was devoted to a business meeting, including a review of a new University program to train Alaska resource management personnel.

John Miller attended the Purdue symposium on Machine Processing of Remotely Sensed Data June 3-6, 1981. The following week he also visited NASA personnel at NASA HQ and at GSFC to commence negotiations leading toward the establishment of near-real-time Landsat image forming capability at the NASA Fairbanks station. The 1980 Alaska Legislature appropriated funds to acquire and operate the additional equipment which would generate high quality "quick-look" images from the real-time Landsat data which routinely is received at the Fairbanks station. These quick-look images would be used for surveillance of critical episodes such as sea-ice navigation, freeze-up and break-up of major rivers, forest fires, and floods from ice jams and outburst events from glacier-dammed lakes. Equipment procurement and installation is expected to take 12 months or more, so the operational use of the new quick-look system is well over a year away. In the meantime facsimile transmissions from the Canadian Prince Albert station are used for key real-time applications of Landsat.

EROS Applications Assistance Facility, NSTL (National Space and Technology Laboratories, Bay St. Louis, Mississippi)

A workshop, called "An Overview of Remote Sensing," was held July 15-18. The 8 participants included professors from the University of New Orleans and Tulane University, employees of the State of Louisiana, including consulting geologists, and in-house personnel.

Other activities during the month included participation with NASA and the Gulf Coast Hydroscience Center in the Community Awareness Program. This is an annual affair in which presentations are given on economic impacts of Federal agencies on surrounding communities. City councilmen, mayors, bankers, and legislators attended the program.

EROS DATA CENTER MONTHLY ACTIVITY REPORT August, 1980

MEETINGS

On August 7, Gary Metz represented EDC at a Geosat Data Management Subcommittee Meeting in Ponca City, Oklahoma and provided updates on: the status of Landsats 2 and 3; the status of the Goddard Space Flight Center (GSFC) and EDC Landsat data processing systems; highlights of the National Oceanic and Atmospheric Administration (NOAA) transition plan for a civil operational land remote sensing satellite system; and current and future activities of EDC.

On August 11, David Hastings met with NOAA personnel in Boulder, Colorado to discuss data pertinent to the Magsat project and to other EDC work.

From August 18-22, at the request of the National Conference of State Legislatures (NCSL) and the National Governors Association (NGA), Tom Loveland visited Phoenix, Arizona to participate in a technical evaluation of the state's Arizona Resource Information System (ARIS).

From August 18-29 an evaluation of Landsat MSS data quality was conducted at EDC. The evaluation team consisted of representatives from EDC, NASA/Johnson Space Flight Center, and NASA/Goddard Space Flight Center. The main team task was to examine and classify recent Landsat data acquisition problems.

From August 20-22, David Hastings served as a panel member at the annual review meeting of the NASA Non-Renewable Resource Branch research program. This program is concerned with the funding of research in the use of remote sensing in the exploration and evaluation of non-renewable resources. The panel consisted of thirteen members from universities, state and federal government agencies, and industry. Approximately thirty proposals were reviewed, with the total amount of funding requested exceeding the amount available.

PROJECTS

Grandwash

The Bureau of Land Management (BLM)/EROS Grandwash project, a follow-up of the BLM/EROS cooperative project in northwestern Arizona, was initiated to demonstrate the flexibility of using an existing digital data set containing Landsat and terrain data to develop other map products more useful to resource managers. The Grandwash planning unit, a subset of the Arizona Vegetation Resources Inventory (AVRI) data set, was extracted and Landsat classified data was aggregated from 83 computer classes to eleven summary classes which are more meaningful to resource managers in the BLM Arizona Strip district. Nine new application examples will be produced to demonstrate the capability of a geographic information system for developing map overlays to meet specific management objectives. The eleven class map and two application examples (Potential Antelope Habitat

and Potential Blackbrush Treatment areas) have been developed and delivered to BLM personnel in Denver. Cover type descriptions for each map and the seven other application examples are to be completed by the end of September.

Large Scale Photos

The BLM/EROS large scale photo study is an assessment of the relative merits of three aerial photography acquisition systems for purposes of wildland resource sampling. The systems being compared are 35mm, 70mm, and 9-inch camera formats. Resolution target photography from the 35mm and 70mm photo contractors has been received and is presently being assessed. The resolution target photography from the 9" photo contractor is expected soon. Contracts have been let and flight maps delivered to the 35mm and 9" contractors for acquiring the needed sampling photography in the AVRI study area. Recent peer review recommendations instigated a reassessment of project objectives and methodology. Most notably, the project will be narrowed in scope and address only the questions of principal concern to BLM.

Remote Image Processing System (RIPS)

Work on the RIPS project has been continuing on schedule, including a significant amount of investigation into data compression, error detection and correction, and optimum communication systems configurations. Based on the results of these investigations, the project team has designed a flexible communications protocol which will allow a host to communicate with a RIP station regardless of hardware or software systems employed at either end of the link. Work has begun on software on the HP-3000/IDIMS and RIPS prototype systems to provide a test of the above protocol under actual field operating conditions.

Fuelmap

The EROS/United States Forest Service (USFS) Fuels Mapping Project is entering the final phases of generating output products and laying the groundwork for an accuracy assessment to be carried out in September. Output products currently being produced include: (1) Calcomp plotter output for the final classified image (with roads) at varying scales; (2) a contour map plotted from the digital terrain data; (3) a "perspective" or isometric plot of one of the quadrangles from the project area; and (4) a pair of "false" stereo images of the Landsat color composite subscene and for the classified fuelmap image.

TRAINING

Interactive Digital Manipulation System (IDIMS) Course

A course for IDIMS users was presented at EDC by ESL, Inc. the week of August 4-8. Thirteen staff members spent the week participating in classroom lectures and Data Analysis Laboratory "hands-on" lab sessions. Class topics included the IDIMS Series III upgrade, new functions and utilities, and advanced analysis functions.

Visiting Scientist

On August 22, Dr. Jack Bryant of Texas A&M University concluded a seven-week residency at EDC. In addition to implementing new programs on IDIMS, Dr. Bryant conducted a lecture series on techniques for the analysis of remotely-sensed data.

University Grant Program

All proposals for the EROS University Grant Program have been evaluated, and those universities to which funding will be provided have been selected. The program provides funds to universities for the development of curricula and materials for training professional resource managers and scientists in remote sensing techniques and applications.

PRODUCTION

Reimbursable Sales

Shipped reimbursable receipts for FY80 through August were \$3,445,239, including the August total of \$267,041. For the scheduled year-end closeout on September 26, anticipated sales should meet the revised-budget FY80 total of \$3,750,000.

EROS Field Office, Anchorage, Alaska

Field Office personnel prepared an overlay to the Landsat Mosaic of Alaska showing the location of the oil pipeline (Prudhoe Bay to Valdez), the proposed route of the Arctic gasline, sites of offshore oil and gas leasing, and major Alaskan towns and villages. The mosaics and overlays were used by the representatives of the Senate Energy and Natural Resource Committee for orientation purposes during their recent tour of Alaska. At the conclusion of their tour, each member was presented with an Alaska Landsat mosaic and overlay prepared by the Field Office.

The Optronics Film Recorder was shipped from EROS Data Center and installed in the Field Office. EROS Data Center personnel participated in the installation and testing of the recorder and provided training to Field Office personnel on the use of the film recorder. Acceptable photo output products were produced by pushing the processing of the film by two f-stops.

The EROS Field Office facility was one of several tours available to participants of Alaska's first conference on Computer Graphics and Geoprocessing. Thirteen attendees visited the Field Office and were given a demonstration of IDIMS capabilities. In addition, Field Office personnel gave a luncheon presentation at the conference entitled, "Use of Remote Sensing Analysis Equipment to Meet Alaska's Resource Needs." The presentation emphasized the capabilities of the Field Office's digital analysis system to manipulate remote sensing data.

BLM personnel used IDIMS to modify their statistics file to be used for classifying four million acres of caribou/reindeer range in the Nulato Hills area of Northwestern Alaska.

Hank Smith, from the Office of the Assistant Secretary for Energy and Minerals, visited the Field Office and was given a demonstration of digital analysis system capabilities to address resource problems in Alaska. In addition, two other demonstrations were conducted for ten BLM personnel.

Field Office personnel traveled to Prudhoe Bay to participate in a vegetation workshop which discussed field techniques for mapping vegetation. This trip provided opportunity to become familiar with plant cover, as well as oil extraction activities at Prudhoe Bay.

EROS Applications Assistance Facility (AAF), Fairbanks, Alaska

Governor Hammond has signed legislation appropriating state funds to the Geophysical Institute (The University of Alaska AAF contractor) for the purchase and installation of equipment at the NASA ground station near Fairbanks to support local generation of full-resolution Landsat images in near-real-time. Equipment specifications have been prepared and a request for quotations has been submitted to industry.

Utilizing "quick-look" facsimile imagery transmitted from the Canadian ground station and observing the area over a sequence of dates, it was noted that Beluga Lake was dangerously high. Similar conditions occurred last year which resulted in flash floodings and endangered people in several fish camps downstream on Beluga River. The Alaska Division of Emergency Services was notified and, in turn, alerted the people to this possible hazard.

NASA has provided funding for a joint research program between NASA/AMES, the Northern Remote Sensing Laboratory (NRSL) of the Geophysical Institute and the University of Washington to develop techniques for the manipulation of Landsat data so that subarctic wetlands can be identified. Tom George and Ken Dean (NRSL) met with Richard Johnson, D. Wilson and Leslie Morrissey (NASA/AMES) and Ricky Fowler (Department of Environmental Conservation) to discuss fund allocations and the work plan. The study will involve a two-year university consortium agreement, with NRSL being the lead research organization.

Approximately 130 individuals visited the Fairbanks facility this month to obtain services and order imagery.

EROS AAF, National Space Technology Laboratories (NSTL) Station, Bay St. Louis, Miss.

A Forestry Remote Sensing Workshop was held August 25-29 in conjunction with the Louisiana State University/Mississippi State University Logging and Forestry Operations Center. Twelve individuals participated. Approximately 115 visitors made use of the NSTL facility during August.

EROS DATA CENTER MONTHLY ACTIVITY REPORT September, 1980

MEETINGS

On September 4, Gary Metz attended a Level II meeting on the Agriculture and Resource Inventory Surveys Through Aerospace Remote Sensing (AgRISTARS) project at NASA/Johnson Space Flight Center in Houston, Texas. The meeting included representatives from NASA, USDA, NOAA, and USDI and included discussions on: the status of the actions from the Level 0 and Level 1 meetings held July 22 and May 21 respectively; status of the FY 81 AgRISTARS budget; foreign activities in Brazil, Argentina, and India related to AgRISTARS; status of the eight projects; the many problems currently associated with Landsat data; and the agenda for the upcoming Level 1 meeting to be held at NASA/JSC November 5, 6, and 7, 1980.

On September 16 and 17, Pat Holkenbrink attended the Configuration Control Board/Landsat Ground Station Operators Working Group (CCB/LGSOWG) meeting in Sao Jose Dos Campos, Brazil. The CCB meets semi-annually to review progress toward the establishment of an international remote sensing video data standard for Landsat Computer Compatible Tapes (CCT's). Topics discussed included each participating country's plans for adopting the standard format, any problems and changes with the format, and status of the international format verification program being developed at EDC. The next meeting is scheduled to be held in April, 1981 at EDC.

On September 19, Wayne Rohde and Wayne Miller met in Olympia, Washington with representatives from NASA/Ames, the Washington Departments of Game and Natural Resources, and Washington State University to review the Washington Department of Game/Pacific Northwest Regional Commission Project.

On September 22, Rohde and Miller met in Denver with Bureau of Land Management (BLM) personnel to review the status of cooperative BLM/EDC activities and to plan FY 81 project work.

On September 24 and 25, Bill Anderson attended and presented an invited paper at the Western Regional Conference of the Irrigation Association in Portland, Oregon. A comprehensive overview was given of the United States Army Corps of Engineers/EROS Data Center (USACOE/EDC) Demonstration Project on remote sensing methods for estimating future irrigation development in the Columbia River Basin.

PROJECTS

Fuelmap

Mark Shasby travelled to western Montana this month for project wrap-up and accuracy assessment work on the United States Forest Service/EROS Data Center (USFS/EDC) Fuelmap Project. Results and final output products were presented at a seminar for USFS personnel on September 19.

USACOE/EDC Cooperative Project

Data Analysis Laboratory work this month included completion of crop type classifications for the three Yakima Basin test sites. While the classification images have a few inaccuracies, it was still possible to generate acreage statistics describing the distribution of irrigated crop types. Following an analysis of each classification, the computer classes will be assigned to their appropriate crop water-usage categories.

TRAINING

Fifteenth International Remote Sensing Workshop

The Fifteenth International Remote Sensing workshop was held this month. Twenty scientists, representing twelve countries, participated. As in the past, the duration was four weeks and emphasis was placed on manual analysis of remotely sensed data (particularly from Landsat), and the approach was multidisciplinary, stressing the importance of merging Earth science and bio-science analyses in the interpretation process.

PRODUCTION

Sales

Total FY 80 shipped reimbursable orders through September 26, 1980 (the date used for fiscal year closeout) reached \$3,675,214. Total incoming FY 80 orders came to \$3,846,811--11% over FY 79 incoming orders. The third quarter for FY 80 was the first million-dollar quarter, at \$1,029,412 while the fourth quarter was the highest ever, at \$1,044,160.

EROS Digital Image Processing System (EDIPS)

Approximately 2700 scenes of Landsat data were received and added to the imagery data base this month. While this total is lower than expected, this is the first complete month of data reception since the NASA decision of mid-August to reprocess all of June and July data. The current backlog of MSS data at GSFC exceeds 16,000 frames. RBV data processing continues to be delayed; however, NASA is currently projecting that this system will be implemented soon, with processing to include all retrospective data acquired after September 1, 1980.

EROS Field Office, Anchorage, Alaska

Personnel from the University of Alaska used the Interactive Digital Image Manipulation System (IDIMS) for several days to review cover classifications in an area just north of Mt. McKinley. The study is a cooperative project between the University of Alaska and the National Park Service to evaluate Landsat computer classifications of cover for caribou habitat.

The Field Office has begun compiling a library of Landsat Computer Compatible Tapes (CCT's) of Alaska. To date, the Field Office has received 298 out of approximately 415 EROS Digital Image Processing System (EDIPS) CCT's of Alaska. The 415 scenes constitute a relatively cloud free scene of high (summer) and low (winter) sun angle for most of the 225 Landsat scenes that cover Alaska.

EROS Applications Assistance Facility (AAF), Fairbanks, Alaska

The contract for local generation of imagery from the Landsat Quick-Look Program, mentioned in last month's report, has been awarded to MacDonald, Dettwiler, and Associates Ltd. of Richmond, British Columbia.

Field work for the Reindeer Range Inventory in the Seward Peninsula has been completed. Tom George will be working on the IDIMS system at the Alaska Field Office in Anchorage later in the fall for this joint project with Soil Conservation Service and Bureau of Land Management personnel.

John Miller recently attended a meeting of the Alaska Mapping Advisory Committee in Anchorage. While there, he visited with Dave Carneggie to bring him up-to-date on our Quick-Look Program as well as other activities. John also met with representatives of the Division of Emergency Services to discuss monitoring the freeze-up of the Yukon River and other applications of quick-look imagery which have been useful to them in the past.

EROS DATA CENTER MONTHLY ACTIVITY REPORT October 1980

MEETINGS

On October 2, Bill Anderson met with personnel from the U.S. Fish and Wildlife Service, DeSoto National Wildlife Refuge, near Omaha, Nebraska. Final plans were discussed concerning a cooperative demonstration project aimed at determining the amount of food (mainly waste corn) available to migrating geese using the DeSoto Refuge. Several successive Landsat images to be acquired during the 1980 goose migration (September through November) will be interpreted with respect to categories of agricultural land use in the 900 square-mile feeding area of the geese. These data will be combined with field data and data from the interpretation of large-scale aerial photographs of 60 randomly selected 640-acre sample sites within the feeding area to provide an estimate of the total amount of food available to the geese at the time of each Landsat overpass.

On October 7, Don Lauer met with the Executive Committee of the American Society of Photogrammetry (ASP) in Niagara Falls, NY, to discuss the subject of training films. A consortium of government agencies is funding the ASP to produce 16mm training films on the applications of remotely sensed data to discipline-specific problems. Two films, entitled "Vegetation Mapping Using Remotely Sensed Data" and "Mineral Exploration Using Remotely Sensed Data," are planned. The films will be made via a cooperative agreement dated September 26, 1980, between the USGS and the ASP Foundation. The USGS will represent the consortium of government agencies sponsoring the project.

On October 9, Gerry Moore and Don Lauer attended a meeting in Reston on Side-Looking Airborne Radar (SLAR) research activities. Proposal procedures for FY 81 funds were discussed. Gerry Moore agreed to serve as technical coordinator for approved projects and to assist in preparing (1) a summary of USGS SLAR activities and (2) tentative conclusions of SLAR data utility through FY 81.

On October 19, Mass Storage Seminar 4 was conducted at EDC by Phillips/Magnavox on the Phillips Optical Disc System.

On October 21, Gary Metz and R. J. Thompson attended a Landsat operations coordination meeting at the NASA/Johnson Spacecraft Center (JSC) in Houston, Texas, which included representatives from EDC, NASA: JSC, Goddard Space Flight Center (GSFC) and Headquarters, U. S. Department of Agriculture, and National Oceanic and Atmospheric Administration (NOAA). The meeting included discussions on: the current status of Landsats 2 and 3

and the GSFC Image Processing Facility; Landsat tape recorder backup plan; and the impact of current Landsat data problems on the Agriculture and Resources Inventory Surveys Through Aerospace Remote Sensing (AgRISTARS) Program.

During the October 28-30 Remote Sensing for Resource Management conference in Kansas City, Missouri, Greg Hanson and Pat Hallyday presented, at a poster session, a co-authored paper, "Improving Estimates of Streamflow Characteristics in the Cumberland Plateau of Tennessee by Using Digital Land-Cover Data from Landsat."

PROJECTS

Field Spectrometer Evaluation: Bryan Bailey spent the week of October 12 through 19 in the Goldfield, Nevada area observing and participating in the field testing of four field spectrometers, three designed and built by NASA's Jet Propulsion Laboratory and one designed and built by Bill Collins of Columbia University.

Word Processing System: Hardware and software for a new EDC word processing system are operating and the system should be ready for demonstration by mid-November.

TRAINING

Surface Mining Remote Sensing Workshop: Gary Johnson, Don Ohlen, and Don Lauer, in cooperation with the Office of Surface Mining, presented a Surface Mining Remote Sensing Workshop from September 29 through October 3 at the Bureau of Mines Academy in Beckley, West Virginia. The workshop was structured to assist mine inspectors with the interpretation of aerial photography. Twenty-nine inspectors were in attendance, representing each of the five OSM regions in the United States. Exercises were given using aerial photography of mined lands in the Beckley area. Verifications of interpretations made on this photography were completed by a field trip to these sites.

OAS/CNIE Geological Remote Sensing Course in Argentina: Charles Trautwein was part of an instructional team for a three-week training course entitled "Applications of Remote Sensing to Geological/Mining Survey" in Buenos Aires, Argentina from October 6-24. The course was co-sponsored by the Argentine National Commission on Space Investigations (CNIE) and the Organization of American States (OAS). Twenty-one South and Central American geoscientists participated, including representatives from Argentina (11), Chile (1), Paraguay (1), Uruguay (1), Ecuador (1), Colombia (1), Venezuela (2), Costa Rica (1), Dominican Republic (1), and Mexico (1). Topics presented during the course included fundamentals of remote sensing along with manual analytic and interpretive procedures for geologists (first week), digital processing techniques for image enhancement and data classification (second week), and a field trip to Catamarca Province

in northwestern Argentina (third week). All examples and workshop exercises were directed toward a geologic evaluation of the field site. Landsat mosaics, images, and digitally enhanced subscenes were employed using a convergence strategy for the geologic investigation.

UN/FAO Remote Sensing For Resource Applications Course in Greece:
Jim Lucas participated in a United Nations/Food and Agricultural
Organization (UN/FAO) Regional Training Seminar on Remote Sensing
Applications for Land Resources, held in Athens from October 7-17.
The seminar was organized in cooperation with the government of
Greece. Twenty-seven participants, including 19 Greeks, took
part. Lectures and workshops were designed to provide the participants
with an overview of remote sensing techniques, emphasizing applications
that could be used in Mediterranean areas. A field trip to the
Atalanti area was also undertaken. Exercises during the field trip
utilized Landsat data to assess both the geology and land cover in
the area.

Remote Sensing Applications Workshops: Gary Johnson participated October 13 as an instructor in the "Application and Processing of Landsat Data" course held at the Mid-American Remote Sensing Center, Murray State University, Murray, Kentucky, October 13-17. He then gave instruction in the October 14 and 15 National Council for Geographic Education Remote Sensing Workshop in Des Moines, Iowa.

Harvard Terrain Analysis Workshop: For the week of October 20-24, the EROS Data Center hosted a training course entitled "Terrain Analysis: Interpretation of Aerial Photographs and Images," conducted by Dr. Douglas Way of the Harvard University Department of Landscape Architecture. The workshop, which emphasized the use of aerial and satellite photography in terrain analysis, geology, soil characteristics and geomorphology, included a tour of the EROS Data Center and presentations by several Applications Branch scientists.

Agricultural Applications of Remote Sensing Workshop: Bill Anderson, Gary Johnson, Paul Seevers, and Tom Loveland taught a workshop on Agricultural Applications of Remote Sensing on October 28 and 29, preceding the Soil Conservation Society of America's Remote Sensing for Resource Management Conference held in Kansas City, Missouri. Thirty-eight students participated in the intensive workshop which emphasized the practical application and limitations of remote sensing techniques applied to meeting agribusiness and production agriculture information needs. Hands-on experience was provided in the interpretation of Landsat images as well as aerial photographs in several scales.

PRODUCTION

Sales

The projected FY 81 reimbursable receipts budget for all data products is \$3,700,000. Shipped reimbursable receipts for the first month of FY 81 were \$437,676 and incoming reimbursable sales were \$383,171.

EROS Digital Image Processing System (EDIPS)

Approximately 3800 new scenes of Landsat Multi-spectral Scanner (MSS) data were acquired in October; however, only 1500 scenes of these data were received at EDC and added to the main image file. This low throughput is due primarily to hardware problems exhibited by the MSS pre-processor memory components in the Image Processing Facility at GSFC. A new memory unit is scheduled for installation in January 1981, after which the volume of MSS data processed is expected to increase. Until this problem is corrected, the current backlog of 18,000 scenes at GSFC is expected to grow.

Digital Return Beam Vidicon (RBV) data is now being processed successfully by the digital systems at GSFC, but also in somewhat limited quantities. Approximately 500 scenes of engineering data have been received to date, none of which have been added to the data base. Several problems have been encountered in the processed imagery, most of them caused by spacecraft characteristics and/or anomalies that cannot be corrected. EDC is currently working with GSFC personnel to document these data problems in order to more completely describe the data to the user community. We are expecting to complete this documentation and add all archived digital RBV data to the data base by the first of December.

EDIPS Upgrade

The equipment required for augmenting EDIPS to handle uncorrected data (HDT-A) from the GSFC systems was delivered in late September. Integration of this equipment with EDIPS was completed by mid-October, and the contractor, TRW, is currently working on-site to complete the software integration. System verification testing will begin in mid-December, followed by a 30-day continuous performance demonstration. Production status is scheduled for early February; however, actual transition to the HDT-A interface with GSFC is currently scheduled for March 1, 1981.

EROS Field Office, Anchorage, Alaska

Personnel from the U.S. Forest Service, Forest Science Laboratory, worked with the Field Office Systems Manager, Mike Fleming, on a cooperative remote sensing project to determine the usefulness of Landsat data for classifying vegetation cover. Fleming is training Forest Service Personnel to use the Field Office digital analysis

system to automate the classification of vegetation at randomly selected grid intersections (5000 m interval) within the Susitna Watershed between Anchorage and Mt. McKinley. The Forest Service is exploring alternative remote sensing approaches to inventory vegetation in Alaska for the National Resource Inventory. The cooperative project provides an opportunity to train Forest Service personnel how to use the digital analysis system, and to determine the contribution of Landsat data within a multistage sample approach to vegetation inventory. The Forest Service is initially concerned with classifying vegetation at 64 sample points within the Susitna Watershed for which they have ground data and supporting aerial photographs.

A two-day training course was conducted for Soil Conservation Service (SCS) personnel during the fourth week of October. Tom George, Geophysical Institute, University of Alaska, was the course coordinator. George and EROS personnel cooperated to prepare materials and provide instruction for the session. A three-day introductory digital analysis course, conducted jointly by NASA and EROS, was given during the fifth week of October for State agency personnel involved in the NASA ASVT. Tony Burns, Municipality of Anchorage, was the course coordinator. Instruction was provided by both NASA and EROS personnel.

Merlin Wibbenmeyer, Department of Natural Resources (DNR), met twice with EROS personnel to determine the cost and feasibility of classifying cover on Landsat data within the "coastal zone" adjoining Bristol Bay. This zone extends from sea level to the 1000-foot contour line and includes an extensive area that spans four Landsat scenes. DNR is concerned not only with developing cover maps for planning purposes, but desires output data compatible with DNR's geobased information management system (COMARC).

EROS Applications Assistance Facility (AAF), Fairbanks, Alaska

Color Landsat images of the Delta Agricultural Project were obtained from the Canadian Quick-Look System for July 2, July 18-20, August 5 and 24, and September 2 (which followed a 2" snowfall). Reconnaissance of the area was made by light aircraft on September 9 and preliminary efforts were made this month at correlating apparent crop vigor with yield data.

Tom George attended the Alaska Science Conference in Anchorage. He also discussed plans for an introductory digital analysis course for Soil Conservation Service personnel conducted jointly by EROS Field Office and Geophysical Institute personnel.

One hundred eleven people obtained services from the Fairbanks facility this month.

EROS DATA CENTER MONTHLY ACTIVITY REPORT NOVEMBER 1980

Meetings

From November 1-22, Jim McCord was on foreign travel under a Participating Agency Service Agreement with the U.S. Agency for International Development. McCord conferred with principals of the National Research Council in Bangkok, Thailand on the installation of the Landsat receiving station and remote sensing data reproduction system for photographic products. While in Thailand, he also conferred with the Director of the Asian Remote Sensing Training Center for the design, equipment acquisition, and installation of a modest remote sensing data reproduction system. After approximately three weeks in Bangkok, McCord traveled to Athens, Greece for discussions with Dr. Michael Moutsoulas, Director of the National Center for Space Research. This newly formed agency is in the process of designing and building a 500 square-meter facility to house a remote sensing data facility.

On November 5 and 6, Bill Bonner and John Baker from the Bureau of Land Management met with several EDC staff members to develop the framework for a cooperative project on implementing Landsat technology for BLM's Soil/Vegetation Inventory Method.

From November 5-7, Gary Metz attended a level 1 Agriculture and Resources Inventory Surveys through Aerospace Remote Sensing (AgRISTARS) meeting at NASA's Johnson Space Flight Center. The meeting included representatives from NASA, USDA, NOAA, AID, and USDI, and covered a status review of the eight AgRISTARS projects; status of AgRISTARS funding and personnel support requirements, and the impact of current Landsat data problems.

From November 12-14, Roy Mead, Virginia Polytechnic Institute, and John Szajgin, EDC, in cooperation with VPI, hosted a working conference at EDC on Landsat classification accuracy assessment procedures. The conference objectives were to determine the state-of-the-art for accuracy assessment procedures, provide a forum for the exchange of ideas and experiences, and identify those aspects in need of research.

During the period from November 17 through 19, Mark Shasby conducted two briefings, one to the Region Six Forest Planners Conference and one to the Northwest Forest and Range Experiment Station, in Portland, Oregon on the objectives, methodology and results of the Fuel Type and Topographic Mapping cooperative project between EDC and the U.S. Forest Service. In addition to these briefings, a fair amount of time was spent in outlining specific objectives for a cooperative follow-up project with the same study site and data set.

Projects

WRD/EDC Project on Mapping Phreatophytes in Nevada: During November 17-21, J. R. Harrill (WRD, USGS) and Robert H. Haas, Calvin Van Zee, Charles Nelson, and Larry Pettinger of EDC completed five sessions using: the Image 100 to extract test site scenes; the Geographic Entry System to digitize and register a reference evapotranspiration (ET) map, and the Interactive Digital Image Manipulation System (IDIMS) to map and extract data from the vegetation ET classes in the Soda Lake area of Nevada. Final labeling of the ET classes remains to be completed. The feasibility of distinguishing and mapping a range of ET classes appears promising.

Word Processing System: A word processing system has been installed in the EDC front office. The system is capable of: communicating to Reston, Anchorage, and the System 6 in Applications Branch; formatting and printing letters and documents; maintaining a mailing list, and producing letters from a mailing list.

Training

Water Resources Remote Sensing Workshop: James Lucas, Gerald Moore, Donna Scholz, and Larry Batten conducted a four-day Water Resources Remote Sensing Workshop at EDC from November 3-6. The purpose was to familiarize the participants with basic remote sensing principles and practical applications of Landsat data and other types of imagery as they apply to water resources investigations. Although the workshop was designed primarily for hydrologists from USGS Water Resources Division and their cooperating agencies, a number of the 22 participants represented private and state agencies.

Advanced Course in Geological Remote Sensing: Charles Trautwein, David Greenlee, Donald Orr, Bryan Bailey, David Hastings, Donna Scholz, Melanie Morgen, Susan Jenson, Fred Waltz and Harvey Wagner conducted a new course, entitled "An Advanced Course in Geological Remote Sensing Techniques" at EDC during the week of November 17-21. Twenty-one participants, representing federal and state agencies, academic institutions, and private industry were involved. The workshop centered on the development, application, and management of geological data bases from the standpoint of mineral and mineral fuel exploration, assessment, and inventory programs. Digital processing techniques were defined with respect to specific geological, geophysical, geochemical, remote sensing, and topographic information requirements. Workshop exercises were directed toward the development of a geologic model for mineral resource exploration using the fundamental concepts of geoscience and data-base processing logic.

Local Government Landsat Remote Sensing Workshop: Jim Sturdevant participated in a Local Government Landsat Remote Sensing Workshop, November 17-18, in Pierre, South Dakota. Sponsored by the Upper Plains States Innovation Group, the objectives of the workshop were: to introduce remote sensing to South Dakota local government officials; to identify possible applications of remotely sensed data in South Dakota; to outline the procedures for acquiring remotely sensed data, and to establish guidelines for implementing cooperative remote sensing projects between local governments and remote sensing facilities in South Dakota.

Production

<u>Sales</u>: Incoming reimbursable sales for November amounted to \$260,838. Shipped reimbursable receipts for the first two months of FY 1981 were \$757,538 which is about 23% higher than the same period last year.

EROS Field Office, Anchorage, Alaska

Personnel from the Northern Remote Sensing Laboratory (Geophysical Institute, University of Alaska) and EROS Field Office jointly conducted a two-day training course for Soil Conservation Service (SCS) personnel. The course emphasized the use of digital Landsat data and digital analysis procedures for classifying land cover. Nine SCS and one University of Alaska (Agriculture Experiment Station) personnel attended.

Personnel from NASA Ames and EROS conducted a three-day training course for various state and federal agency personnel who are involved with NASA remote sensing projects in Alaska. The training course emphasized digital analysis techniques and provided students with an opportunity to observe many of the IDIMS capabilities for performing image display and cover classification. Eight participants attended the course, including four from the Alaska Department of Natural Resources, two from the Soil Conservation Service, one from the Alaska Department of Environmental Conservation, and one from the Community and Regional Affairs Office.

Mike Fleming traveled to the EROS Data Center to participate in the conference on Landsat classification accuracy assessment procedures.

EROS Applications Assistance Facility (AAF), Fairbanks, Alaska

John Miller attended several meetings in Anchorage. He met with the Task Force on Remote Sensing, visited with Dave Carneggie at the Alaska Field Office, and attended a Committee on Natural Resource Information Management (CONRIM) meeting at which he made a presentation on the current status of the Alaskan Landsat Quick-look System.

Tom George was involved in conducting the two-day training session for Soil Conservation Service personnel at the Alaska Field Office. Following the training session, he traveled to Kansas City and attended a conference sponsored by Soil Conservation on Remote Sensing for Resource Management. A display, featuring work he has been involved with on the Seward Peninsula reindeer range, was prepared for the poster session at the conference.

User activity was heavy this month, including seven facility tours and eighty-seven user contacts.

EROS DATA CENTER MONTHLY ACTIVITY REPORT DECEMBER 1980

MEETINGS

During the November 30-December 4 Institute of Electrical and Electronic Engineers Computer Society Conference in Miami Beach, Florida, Brian Bauer was a panel discussion member and delivered a paper on recent image processing algorithms and their impact on remote sensing.

From December 1-6 Wayne Miller and Robert Haas participated in the International Conference on Arid Land Resource Inventory in La Paz, Mexico. Haas presented a paper, "Classifying and Characterizing Natural Vegetation on a Regional Basis with Landsat MSS Data," and Miller presented a poster, "Digital Landsat and Terrain Data Applied to an Arid Land Resource Inventory." Conference participation included approximately 200 scientists and technicians from 11 countries.

From December 1-7 William Draeger participated as a member of an international team of experts, convened at the International Institute for Aerial Survey and Earth Sciences (ITC) in Enschede, the Netherlands, to prepare a background paper on training in remote sensing applications. In August, 1982, the United Nations will convene the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82) in Vienna, Austria. In order to assist member states in the preparation of their national papers, the General Assembly authorized the preparation of a number of background papers. ITC was asked to coordinate the activities of the team addressing the subject of remote sensing training.

On December 3 and 4 Patrick Holkenbrink attended the American Institute of Aeronautics and Astronautics Conference in Denver, Colorado, and presented a paper on a conceptual ground processing system for operational Landsat data.

On December 4, Gary Metz attended the Level II meeting on Agriculture and Resources Inventory Surveys through Aerospace Remote Sensing (AgRISTARS) in Washington, D.C. The meeting included representatives from NASA, USDA, NOAA, and USDI.

On December 4 and 5 David Hastings attended NASA's Magnetic Field Satellite (MAGSAT) Investigator's Meeting at the Goddard Space Flight Center in Greenbelt, Maryland. NASA scientists working with MAGSAT reviewed the operational history of the satellite, which was in orbit from October 30, 1979, to June 11, 1980. They also reviewed the status of the processing and distribution of MAGSAT data to investigators. Finally, investigators met in working groups to discuss results, problems and cooperation in their respective areas of interest.

From December 16-18, representatives of the Army Corps of Engineers' Pacific Division and Portland District met with EROS applications scientists to review the results of the EDC/COE Columbia River and

Tributaries Irrigation Withdrawals Analysis Project, complete the refinement of an irrigation development potential model, and develop a plan for documenting project techniques and results.

PROJECTS

Bidirectional Reflectance Analysis, TERRA, Inc.: A government contract issued to TERRA, Inc., on October 1, 1980, will address bidirectional reflectance analysis and correction procedures for implementation at the EROS Data Center. Recent discussions were held at EDC with TERRA personnel on project coordination, Data Analysis Laboratory access and documentation.

<u>USF&WS</u> <u>Service Project</u>: Significant recent accomplishments include the completion of the small-format aerial photograph acquisition tasks. Ground data has been completed on the 59 sample sites and has been used to construct airphoto interpretation keys. Reports on available Landsat data were also received and an order for color compositing the October 10, 1980 image was initiated. Upon completion of the color composite, 1:250,000 scale paper prints will be prepared for interpretation by USFWS personnel at Iowa State University.

TRAINING

Digital Remote Sensing Training Course for BLM Geologists: Donna Scholz presented a digital remote sensing training course to 16 Bureau of Land Management (BLM) geologists December 14-19 in Denver, Colorado. This course was designed to emphasize the analysis capabilities of the BLM IDIMS minicomputer at the Denver Federal Center. Computer exercises allowed participants to perform image enhancements, classifications, geologic modeling and gain an understanding of geologic data set integration with Landsat spectral data. The course goal was to familiarize BLM geologists with current remote sensing technology with respect to their work in mineral assessment of BLM lands.

PRODUCTION

Sales

December's shipped reimbursable receipts amounted to \$302,886. Shipped reimbursable receipts for October through December were \$1,060,424, running 12.4% ahead of the FY 1981 plan.

EROS Digital Image Processing System (EDIPS)

Approximately 2500 scenes of MSS data and 5600 subscenes of RBV data were processed and added to the main image file during December. Major hardware problems experienced at Goddard Space Flight Center during November have been resolved, at least temporarily, and data flow has improved as a result. The MSS backlog includes 19,500 scenes of MSS data and about 4000 RBV subscenes. RBV acquisition rates continue to exceed the throughput capacity of the image processing system, so the RBV backlog is expected to grow.

EROS Field Office, Anchorage, Alaska

Personnel from the Northern Remote Sensing Laboratory (Geophysical Institute, University of Alaska) used the Field Office digital analysis system (IDIMS) to produce and evaluate cover maps for 1.5 million acres on the Seward Peninsula for the Bureau of Land Management, Fairbanks District. The cover maps are the first step in the assessment of caribou and reindeer carrying capacity on the Seward Peninsula.

Al Watkins, Chief, EROS Data Center and Don Lauer, Chief, Applications Branch, EROS Data Center, spent three days in Alaska visiting the Field Office in Anchorage and the Northern Remote Sensing Laboratory in Fairbanks. The purpose of their visit was to review the activities of the Field Office and to discuss cooperative working relationships with the Northern Remote Sensing Laboratory. During their visit, Watkins and Lauer met with personnel from U.S. Geological Survey, Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, Alaska Department of Natural Resources, and Office of the Special Assistant to the Secretary of Interior to learn about the resource assessment requirements of each agency as mandated by the Alaska National Interest Lands Conservation Act. These visits afforded an opportunity to begin discussing forms of remote sensing assistance the Field Office can provide for resource agencies responding to the recently passed legislation. Personnel from the Bureau of Land Management (BLM) and EROS Field Office used IDIMS to develop data set examples that demonstrate the system's capability to digitally manipulate Landsat data. The data sets included subscenes of the Anchorage area and portions of the National Petroleum Reserve of Alaska (NPRA). These data sets were used as part of a half-day remote sensing workshop conducted for BLM managers and administrators by BLM remote sensing coordinator, Dr. Paula V. Krebs.

EROS Applications Assistance Facility (AAF), Fairbanks, Alaska

Tom George spent a week at the EROS Alaska Field Office doing image processing on the IDIMS for his joint SCS-BLM project. While in Anchorage Tom also represented the Geophysical Institute at a Subcommittee on Natural Resources Information Management (CONRIM) meeting.

John Miller attended a meeting of the Alaska Rural Development Council in Fairbanks. The U-2 coverage obtained last August of the Delta Agricultural Project was on display and generated considerable interest among both farmers and legislators. An amendment to an official state policy on agricultural development has been suggested which would enlarge support for agricultural research to include development of remote-sensing techniques in support of agriculture in the northern environment. A suggested revision of state agricultural policy is under consideration by the Department of Natural Resources.